

C l a i m s

1. Speed-dependent pressure regulation for hydraulic pumps,
5 particularly for oil control pumps including a conveying capacity adjusting means for the lubricating oil supply of internal combustion engines, comprising a control piston (1, 41, 69) and a control spring (16, 70, 96) for generating a control pressure for a pressure bias of said
10 conveying capacity adjusting means (10, 60), as well as means for applying an additional force that acts upon said control piston (1, 41, 69), **characterized in that** said additional force is provided by a differential pressure piston (20, 42, 79) which is biased by a centrifugal pressure which acts in dependence upon the number of
15 revolutions in at least one oil filled radial bore (26, 62) of a rotating component (5, 61).
2. Speed-dependent pressure regulation for hydraulic pumps
20 according to claim 1, characterized in that the radial bore (26, 62) comprises at least one of the following characteristics:
 - (a) it is located in a conveyor wheel (5, 61) of said oil control pump either in direction of the centrifugal force or inclined to it;
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 - (b) at its extreme end, it is biased in predetermined angular positions of rotation of the conveying wheel (5, 61) by conveying pressure from a pressure chamber (23) or from a pressure pocket (82).
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3. Speed-dependent pressure regulation for hydraulic pumps according to any of the preceding claims, characterized in that the differential pressure piston (20, 42, 79) comprises at least one of the following characteristics:
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 - (a) it is biased by conveying pressure through at least one pressure connection (22, 83) at one side, and at

the opposite side by the conveying pressure reduced by the centrifugal pressure;

- (b) it is integrally formed with said control piston (1) and transfers said additional force directly onto said control piston (1);
- (c) it is axially movable relative to the control piston (1) and transfers said additional force via a spring (43, 81) onto said control piston (41, 69);
- (d) it comprises a throttle chamber (97).

4. Speed-dependent pressure regulation for hydraulic pumps according to any of the preceding claims, characterized in that the control piston (1, 42, 69) comprises at least one of the following characteristics:

- (a) it comprises a control spring (16, 72) for the differential pressure piston (42, 79) and a spring (43, 81) which acts in the same direction, the spring (43, 81), without a pressure force of said differential pressure piston (42, 79), being preferably force-lessly unstressed, while being limited in its force by the stop (42, 79) thereof with a maximum pressure force of said differential pressure piston (42, 79);
- (b) it comprises a control groove (75) which, in control position, overlaps slightly a pressure bore (76), on the one hand, and a relief bore (78) on the other hand;
- (c) via a control spring (96), it props exclusively against said differential pressure piston (79);
- (d) it is integrally formed with said differential pressure piston (20).

5. Speed-dependent pressure regulation for hydraulic pumps according to any of the preceding claims, characterized in that the pressure connection to said differential pressure piston comprises at least one of the following characteristics:

- (a) the pressure connection from the radial bore (26, 62) to said differential pressure piston (20, 42, 79) is effected through a transverse connection (28, 84), which is oriented to the pressure chamber (23) or to the pressure pocket (82), of a stationary journal bolt (29, 63) of the conveying wheel (5, 61);
 - (b) the pressure connection (22, 25) to said differential pressure piston (42) comprises a filter (30, 31);
 - (c) the pressure connection (22, 25) to said differential pressure piston (20, 42) comprises a throttle (50).
6. Speed-dependent pressure regulation for hydraulic pumps according to any of the preceding claims, characterized in that, in the case of an oil regulating pump with an external teeth wheel, the control piston (69, 96) as well as the differential pressure piston (79) too are located within conveying capacity adjusting means formed as a displacement unit (60) including a reset spring (67) in a spring chamber (68).
7. Speed-dependent pressure regulation for hydraulic pumps according to any of the preceding claims, characterized in that the control piston (69) situated in said displacement unit (60) is in pressure connection with said spring chamber (68), and that preferably at least one of the following characteristics is provided:
- (a) the pressure connection runs through a pressure tube (72) which penetrates a cover (73) of said displacement unit (60);
 - (b) said spring chamber (68) is adapted to be biased with oil pressure through a throttle bore (90) and by a solenoid valve (89);
 - (c) said spring chamber (68) is pressure controlled by a pressure relief valve (91).

8. Speed-dependent pressure regulation for hydraulic pumps according to any of the preceding claims, characterized in that the pressure, which acts in said chamber (66)
5 onto said displacement unit (60), is enabled to be switched off, preferably by a solenoid valve (93).
9. Speed-dependent pressure regulation for hydraulic pumps according to any of the preceding claims, characterized
10 in that the centrifugal pressure surface (48) of said differential pressure piston (48) is enabled to be pressure relieved by a solenoid valve (47).